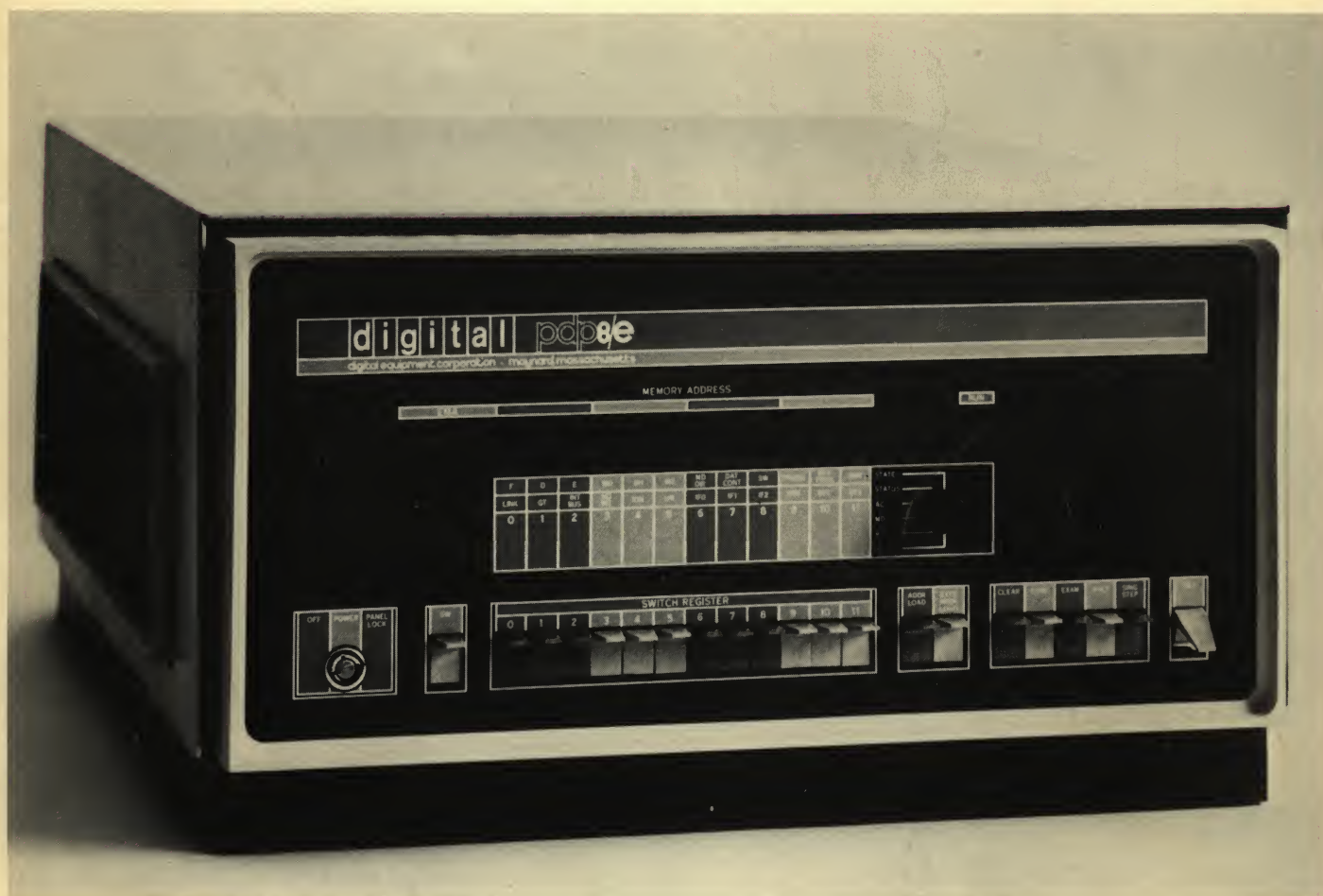


focal 8

digital



Programmable Desk Calculator

- Simple Operation using English Statements
- Calculations using Integer or Floating Point Numbers
- Up to 1100 available Storage Locations
- Text Manipulation and Direct Report Generation
- Editor for Program Modification
- Data Input and Output via Paper Tape or Key Board
- Full set of Mathematical Functions (including Trig Functions)
- Full Alphanumeric Character set Key Board
- Unlimited Expansion Capability for Plotters, Oscilloscopes Analogue/Digital Converters
- Up to 7 simultaneous Users on Expanded Versions
- Expands for remote connection to PDP-10, I.B.M., UNIVAC and other large Computer Systems

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DIGITAL EQUIPMENT is by far the largest manufacturer in the Mini-Computer industry, and is the third largest of all computer manufacturers in terms of installations (over 10 000).

FOCAL-8 is an easy to use, powerful and inexpensive programmable desk calculator. Anyone can sit down and use FOCAL-8 in a few minutes. Table generation, line plots, and even complex integral equations are easily performed on the typewriter-like keyboard without complex programming. And, FOCAL-8 gives the user hard copy of this work at all times.

For more complex calculations and tedious, repetitive tasks, FOCAL-8 can be easily programmed. Even a beginner can be writing and using fairly complex programs in less than two hours. Common English is used as commands to direct FOCAL-8. The operator can check his programs as he prepares it, adding, changing, or deleting lines or characters. FOCAL-8 will even tell him where and how he went wrong if he makes an error. Programs and data can be easily saved on paper tape for later use. The operator need only feed in an existing program, type in new variables, and FOCAL-8 does the rest. Table generation, differential equations, binomial expansion, geometric designs, eigen-values, simulation, trigonometric problems, and many others.

The **FOCAL-8** programmable desk calculator is used by students, engineers, accountants, and scientists to solve a wide range of numerical problems. Up to 1100 memory locations allow the user to store a much larger number of variables in integer or floating point notations than offered on other calculators. And DIGITAL offers many other important benefits with FOCAL-8, amazingly low-cost, fast and dependable service all over Europe, almost unlimited expansion, and many more.

FOCAL-8 Functions:

Functions are provided to improve and simplify arithmetic capabilities and to give potential for expansion to additional input/output devices. A standard function call consists of four (or fewer) letters beginning with the letter F and followed by a parenthetical expression. There are three basic types of functions: simple, extended, and input/output. The first type contains integer part, sign part, absolute value and square root functions. In the second type, the extended arithmetic functions, are used at the option of the user. They compute logarithms, exponentials, arctangents, sines, and cosines.

MATHEMATIC FUNCTIONS:

- Exponentiation
- Multiplication
- Division
- Addition
- Substraction
- Square Root
- Absolute Value
- Sign Part of the Expression
- Integer Part of the Expression
- A Random number Generator
- Natural Base to the Power

GRAPHICS + PLOTTER FUNCTIONS:

- Value is X co-ordinate
- Value is Y co-ordinate
- Erase screen
- Display Cursor
- Display Points

TRIGONOMETRIC FUNCTIONS:

- Sine
- Secant
- Cotangent
- Arc Cosine
- Arc Secant
- Arc Cotangent
- Hyperbolic Cosine
- Hyperbolic Secant
- Hyperbolic Cotangent
- Arc Hyperbolic Cosine
- Arc Hyperbolic Secant
- Arc Hyperbolic Cotangent
- Cosine
- Arc Tangent
- Naperian Log
- Analog to Digital Input Function
- User Generated Function
- Storage Function
- Cosecant
- Arc Sine
- Arc Cosecant
- Hyperbolic Sine
- Hyperbolic Tangent
- Hyperbolic Cosecant
- Arc Hyperbolic Sine
- Arc Hyperbolic Tangent
- Arc Hyperbolic Cosecant

To Modify a Program

A built in editor allows easy program change without complete re-write. If an error is detected during the execution of your program an error message is automatically printed. To facilitate a correction and to eliminate the need to re-write the entire step, a **MODIFY** command is given, whence the system searches for the particular character typed by typing out the contents of that program step until the search character is found. Additional control commands will advance to the next occurring search character, change that character, terminate that step or leave that step unmodified.

To Output Results or a Program for Future Use

To make the output of your calculations or programs absolutely clear, the system enables you to incorporate messages and column headings. The full alphanumeric character set of your typewriter is available for all formats.

Although for most input and output the user would communicate via the typewriter keyboard, the system is equipped in its standard version with a paper tape reader and punch. This allows storage of a library of programs, data from other devices (eg. data loggers) may be fed into the calculator and output results may then be interchanged with other computer systems.

To Expand a FOCAL-8 System

An extremely broad range of peripherals are available which can be field installed to a basic system. These include: plotters, oscilloscope displays, analogue to digital converters, industry compatible magnetic tape and a broad range of communications equipment for local or remote connection of the system to larger computer installations.

Some General Examples Using FOCAL-8

- 1) **ABSTRACT:** Given value a, b, c of a first degree quadratic equation — compute the roots of the equation based on the quadratic equation theorem: given $ax^2 + bx + c = 0$, then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

PROGRAM:

```
*
01.10 ASK !! ?A B C ?; SET ROOT=B+2-4*A*C
01.20 IF (A) 1,4,1.3,1.4
01.30 TYPE I "THIS IS A FIRST DEGREE EQUATION" I; GOTO 1.1
01.40 TYPE %6.03, I " THE ROOTS ARE"; IF (ROOT) 1.7,1.6
01.50 TYPE I,(-B+FSQT(ROOT))/2*A,I,(-B-FSQT(ROOT))/2*A;GOTO 1.1
01.60 TYPE I,-B/2*A,I; GOTO 1.1
01.70 TYPE " IMAGINARY "I,-B/2*A," + (" ,FSQT(-ROOT)/2*A," )" "I"
01.80 TYPE I,-B/2*A," - (" ,FSQT(-ROOT)/2*A," )" "I; GOTO 1.1
```

EXECUTION:

```
*GO
A : 2
B : 5
C : 2
```

```
THE ROOTS ARE
=- 0.500
=- 2.000
```



```

02.05 T I" ODD LOTS
02.10 SET BROKER=.125; IF (PRICE-55) 2.2; SET BR=.250
02.20 S SH=SH-ODDS
02.30 S QU=OD*PR
02.40 IF (QU-400)2.47;IF (QU-2400)2.45;IF (QU-5000)2.43
02.41 S CO=QU*.001+37;G 2.8
02.43 S CO=QU*.005+17;G 2.8
02.45 S CO=QU*.010+5;G 2.8
02.47 S CO=QU*.020+1;G 2.8
02.80 T "COMMISSION ON "%3,OD," ODD SHARES IS "%7.02,CO+BR*OD
02.90 S OC=CO+BR*ODDS ; IF (OF-0BUY) 3.1, 2.9, 3.1
02.91 T I" OUTGO", OC+QU,I
02.93 IF (SH)E,0.1.55

03.10 T I" INCOME "QU-OC,I
03.20 GOTO 2.93

```

EXECUTION:

•GO

```

**** BUY OR SELL?:BUY
HOW MANY SHARES :120 PRICE : 22.50
PRICE*SHARES= 2700.00 $

```

```

ODD LOTS COMMISSION ON = 20 ODD SHARES IS = 12.00
INCOME = 438.00

```

```

ROUND LOTS COMMISSION IS = 29.50
OUTGO IS NET = 2741.50 $

```

Applications

- Computer aided instruction
- Trigonometric problems
- Numbers systems and base conversion
- Geometric design
- Factor analysis
- Binomial expansions
- Statistics
- Single or multi-function plotting
- Linear algebra (simultaneous equations, matrices etc.)
- Differential equations
- Table generation
- Simulation
- Least squares fit
- Eigenvalues
- Digital filter design
- Closed circuit traverse analysis
- Measurement units conversion
- Data monitoring
- Compound interest
- Stocks and bonds analysis
- Decision theory
- Budgeting
- Scope and plotter output, and A/D input
- Many others

- 2) **ABSTRACT:** Generation of a table of the sine, cosine, natural logarithm and exponential values of a variable I in steps of 0.00001

PROGRAM:

```

01.05 T "      I      SINE      COSINE      LOG      E" I
01.10 FOR I=1,.00001,1.0001; DO 2.05
01.20 QUIT
02.05 T %7.06,I," ",FSIN(I)," ",FCOS(I)," ",FLOG[I]," ",FEXP(I),I

```

EXECUTION:

```

*GO
I      SINE      COSINE      LOG      E
= 1.000000 = 0.841471 = 0.540303 = 0.000000E+00 = 0.271828E+01
= 1.000010 = 0.841476 = 0.540295 = 0.977507E-05 = 0.271831E+01
= 1.000020 = 0.841481 = 0.540286 = 0.195501E-04 = 0.271834E+01
= 1.000030 = 0.841487 = 0.540278 = 0.293249E-04 = 0.271836E+01
= 1.000040 = 0.841492 = 0.540270 = 0.390997E-04 = 0.271839E+01
= 1.000050 = 0.841497 = 0.540262 = 0.488744E-04 = 0.271842E+01
= 1.000060 = 0.841503 = 0.540254 = 0.586490E-04 = 0.271844E+01
= 1.000070 = 0.841508 = 0.540245 = 0.684235E-04 = 0.271847E+01
= 1.000080 = 0.841513 = 0.540237 = 0.781980E-04 = 0.271849E+01
= 1.000090 = 0.841519 = 0.540229 = 0.879723E-04 = 0.271852E+01
= 1.000100 = 0.841524 = 0.540221 = 0.977465E-04 = 0.271855E+01

```

- 3) **ABSTRACT:** Given the length of the first side and the degrees of the adjacent angle, this routine computes the hypotenuse, the length of the second side, and the number of degrees for the other angle.

PROGRAM:

```

01.10 ASK "SIDE S1 EQUALS" S1
01.20 A "ADJACENT ANGLE A2 EQUALS" A2; TYPE "DEGREES" II
01.30 S RATIO=3.141592/180; SET A1=90-A2
01.40 SET HYP=S1/FSIN(A1*RATIO); SET S2=FSQRT(HYP+2-S1+2)
01.50 T "SIDE S2", S2,I, "HYPOTENUSE", HYP,I
01.60 T "ANGLE A1", A1, I

```

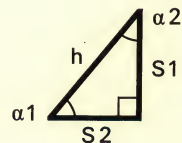
EXECUTION:

```

*GO
SIDE S1 EQUALS:5
ADJACENT ANGLE A2 EQUALS:30
DEGREES

SIDE S2 = 2.89
HYPOTENUSE = 5.77
ANGLE A1 = 60.00

```



- 4) **ABSTRACT:** To output in graphic form, some given function over a range of values. In this example, the function used is $Y = 30 + 15 (\sin(X) e^{-.1x})$ with x ranging from 0 to 15 in increments of 0.5.

PROGRAM:

```
08.01 F I=0,.5,15; T " ",I; F J=0,30+15*FSIN(I)*FEXP[-.1*I]; T " "
```

EXECUTION:

```
•DO 8.01
```



- 5) **ABSTRACT:** Stock Market Commissions. During a stock purchase through a broker a commission will be charged based on a series of rates for units of 100 shares (even lots) and a definite set of charges for smaller units (odd lots).

PROGRAM:

```
01.05 E
01.10 A II".... BUY OR SELL?"OR
01.20 A I"HOW MANY " ?SHARES PRICE ?,I
01.40 T %8.02,?PRICE*SHARES?," $"
01.45 S ODD=SHARES-FITR(SHARES/100)*100
01.50 I (-OD) 2.05;
01.55 T II"ROUND LOTS
01.60 S AM=PRICE*SHARES
01.70 I (AM-400) 1.73 ;I (AM-2400) 1.75;I (AM-5000) 1.77;C
01.71 S CO=AM*.001+39;G 1.8
01.73 S CO=AM*.020+ 3;G 1.8
01.75 S CO=AM*.010+ 7;G 1.8
01.77 S CO=AM*.005+19;G 1.8
01.80 T "COMMISSION IS "CO,I
01.85 I (FABS(OR-0BUY)),1.86;S NET=QU+AM-OC-CO;T "INCOME";G 1.87
01.86 SET NET=QU+AM+OC+CO ;T "OUTGO
01.87 IF (CO+OC-6) 1.9; IF (<OC+CO>(<OD+SH>-1.50) 1.88,1.9,1.9
01.88 T "IS ",?NET ?, " $" ,I ; GO
01.90 A "EXCEPTIONAL COMMISSION " CO;G 1.85
```